Objective and observations of the tests

Objectives:

- ***Make studies of the resistance with the torque machine and studies of the life cycles in different situations with clinical motor, on screw and screwdrivers of the new hexalobular 3.0 Dynamic Abutment system with angulation up to 30º.***

Identification of the pieces being analyzed:

Piece reference	Description	Material	Batch
TPDH2	Clinical hexalobular screw of PD2.0 system, M2.	Titanium	prototype
DSPDCLH-24	Hexalobular screwdriver of PD2.0 system, up to 30º of inclination	Stainless steel	prototype

Measuring equipment employed in the analysis of functionality

Brand and Model	Description
Torque Machine IMADA HTG2-15	Torque machine: CHECKLINE EUROPE. Brand: IMADA, Model: HTG2-15, Capacity 15 LBf-IN. With Dynamic Abutment screwdriver DSPDCL-32 (fig.1)
Clinical motor + Contra-angle W&M ImplantMED	Clinical motor with pedal actuator which allows regulating the torque. With contra-angle and dynamic abutment screwdriver DSPDCL-32 (Fig. 2)

Fig.1


Fig.2

Clarification on the methodology used in the tests:

1 - Test) Torque machine test:

The test is performed by simulating the working conditions of the components, with the replica on the Tilite milled base fixed in the vise, applying torque until start elastic deformation and finally until breakage.
(Simulation without angulation)

Results obtained from the tests:

TPDH2 test Ø2,32 **(prototype)**	**Screw/screwdriver condition**
10 cycles to 30 N·cm	ok
10 cycles to 40 N·cm	ok
Maximum torque until breakage	Breakage of the Screwdriver tip to 43,9 N·cm

2 - Test) Clinical motor + Contra-angle W&M Implant MED test:

This test consists on applying fastening and loosening cycles to 30 N • cm for metric 2, until the screw loses the head form thus obtaining a number of life cycles.
(Simulation without angulation)

Results obtained from the tests:

Sample	**N·cm applied**	**Supported cycles**	**Screw head condition**
Test A	30	100	OK (without losing form)
Test B	40	14	KO (Breakage of screwdriver)

Test A

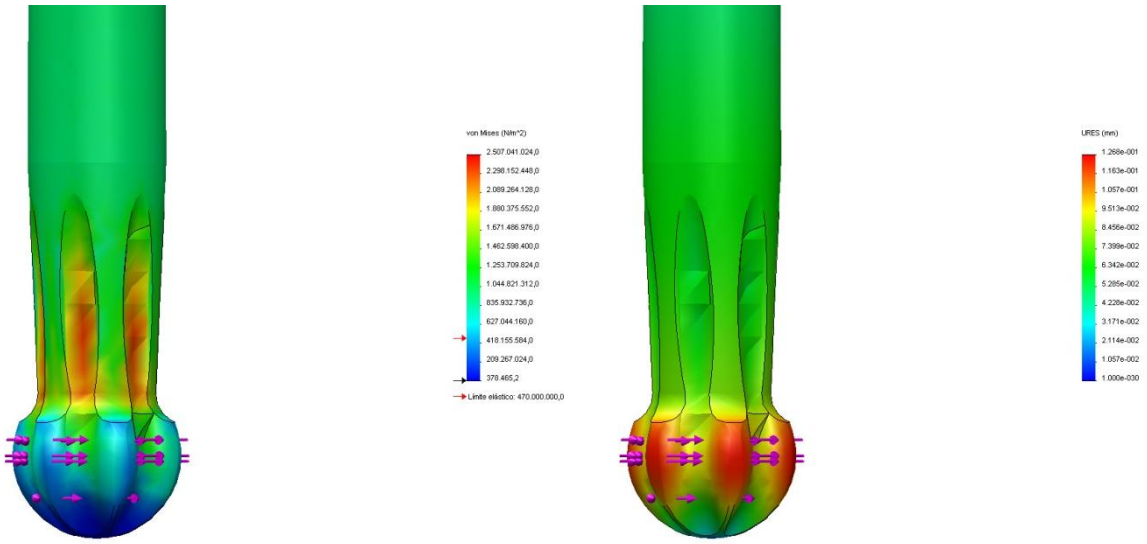
Test B

When applied 40 N·cm the screwdriver is deformed in the first cycles splitting the tip of the ball

Study with finite elements (Screwdriver and screw)

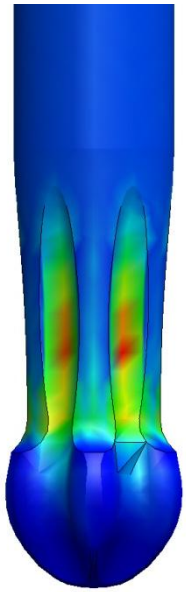
Results of applying a load of 30 N • cm to the screwdriver:

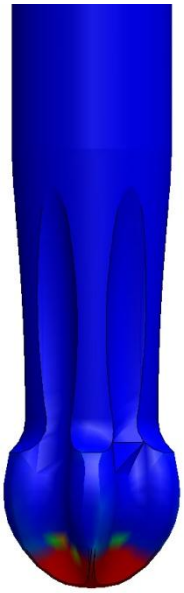
Static Study:

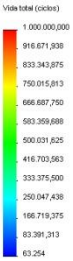


Stresses (N/m2) ***Displacements (mm)***

Fatigue study:



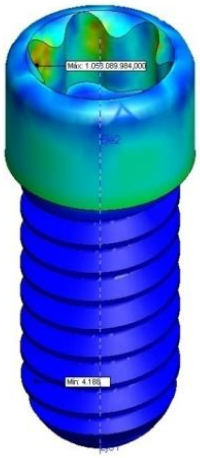


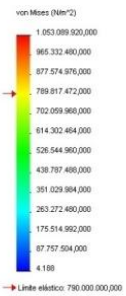


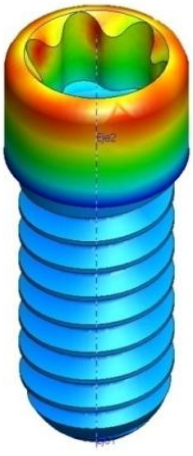
Damage percentage (%)(200 cycles) ***Total life (cycles)***

Results of applying a load of 30 N • cm to the screw:

Static Study:

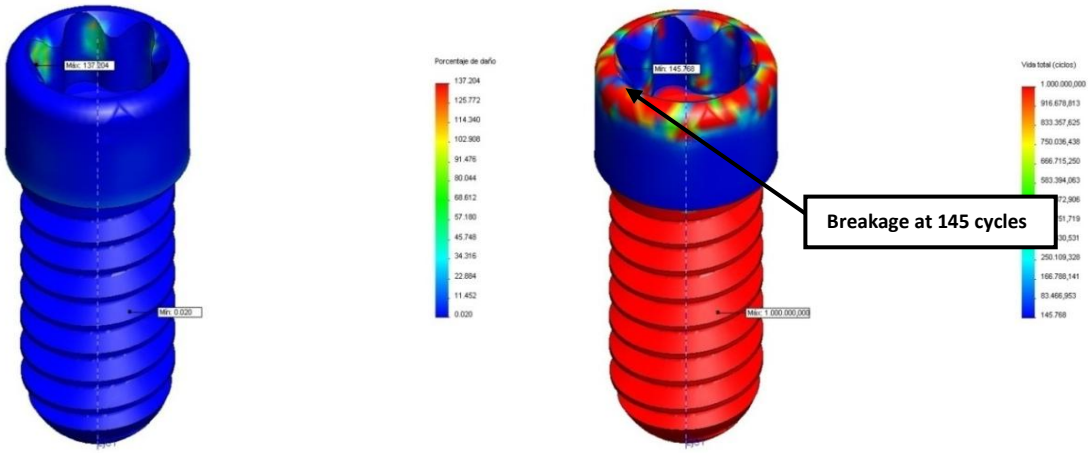






Stresses (N/m2) ***Displacements (mm)***

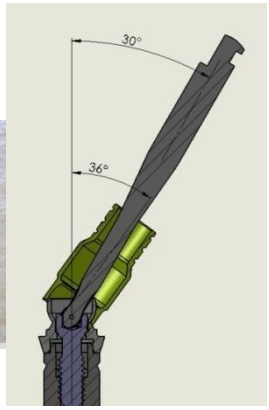
Fatigue study:



Damage percentage (%)(200 cycles) ***Total life (cycles)***

3 - Test) Clinical motor + Contra-angle W&M Implant MED test:

This test consists on applying fastening and loosening cycles making 20 cycles to 30 N·cm; 20 cycles to 40 N·cm until the screw loses the head form/ the screwdriver breaks obtaining thus the number of life cycles. (Simulation with 28º/30º angulation)



Results obtained from the tests:

Sample	N·cm applied	Supported cycles	Screw head condition
Test C	30	35	KO (Screw loses the head form)
Test D	40	18	KO (breakage of screwdriver)

The following pictures show the hexalobular after 30 fastening cycles, we observe that hexalobular faces are deformed by the screwdriver (test D).

As a final observation, along the tests it was found that several cycles, deforms the settlement of the screw.

Conclusions

The results obtained show that the screw and screwdriver set, support a work load lower than 30N·cm without having problems.

R&D Department

Lleida, 05/11/2012